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Surface conductivity of a CMOS silicon nitride layer

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Abstract

This paper reports on the detailed characterization of the surface conductivity of CMOS silicon nitride layers under various environmental conditions. The nitride layers are applied as passivation layers in gas sensors based on suspended gate field effect transistors (SGFET). Test structures consisting of comb electrodes were characterized at temperatures between 20°C and 80°C and relative humidities between 20% and 90%. Values of the surface sheet resistance R_{sq} between $10^{14} \Omega$ and $5 \times 10^{17} \Omega$ were extracted from steady-state resistance measurements and transient measurements probing the time-dependent surface charging. The experimental results are compared with finite element simulations which implement the effect of surface charging through a distributed resistor-capacitor network.

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